Guidance for Addressing Erosional Stability During All Phases of Landfill Operation

(30 TAC §330.63(c)(1), §330.305(c), (d) and (e))
02/14/07

I. Understanding of Intent of Rule with Respect to Phased Operation

The intent of the rule is found in the preamble which states "The commission requires, in 30 TAC §330.305(d), that the owner or operator provide long-term erosional stability for the landfill unit during all phases of unit operation, closure, and post-closure care from the previous requirement in 30 TAC §330.55(b)(8), which only requires long-term erosional stability for the final cover design." In accordance with 30 TAC §330.63(c) Facility Surface Water Drainage Report, the landfill owner or operator is required to submit a report demonstrating their plan to minimize erosion during all phases of landfill operations with the intent of controlling soil loss and sediment transport from top d m surfaces and external embankment side slopes.

Landfill cover phases are defined as daily cover, interme te cover, and fi l cover. Top dome surfaces and external embankment side slopes for the purposes of com liance with 30 TAC §330.305(d) are:

a. those above grade slopes that directly drain to th ite perimeter stormwater management system (i.e., areas where the stormwa directly flows to a perimeter channel or detention pond designed in accordance wit 0 TAC §§330.63(c), 330.303, and 330.305);

b. have received intermediate or final c ver; a

c. have either reached their permitted elevation, or wil subsequently remain inactive for longer than 180 days.

Slopes which drain t ongoing aste placement, preexcavated areas, areas that have received only daily cover or as under construction which have not received waste are not considered external si slope

Modern landfill developme can take decades and interim top dome surfaces and external embankment side pes can ist for many years before placement of the final cover system with permanent drai ge featur . Some past landfill practices have included large, sparsely-ve ated areas witho sufficient drainage control features (e.g., berms, benches, terraces, swale downchutes/le own structures, etc.), leading to erosion and off-site discharge of sedimen

Managemen ractices utilized for erosion and sediment control may be broadly categorized as nonstructura nd structural controls. Nonstructural controls addressing erosion typically include: plans and designs to minimize disruption of the natural features, drainage, topography, vegetative cover features; phased development to minimize the area of bare soil exposed at any given time; plans to disturb only the smallest area necessary to perform current activities; scheduling of construction activities during the time of year with the least erosion potential; and specific plans for the stabilization of exposed surfaces in a timely manner. Structural controls are preventive and also mitigative since they control erosion and sediment movement. Structural controls include vegetative and nonvegetative stabilization of exposed surfaces, perimeter controls, sediment traps, improved sediment basins, silt fences, filter fabrics, stream crossings, etc.

The use of best management practices incorporating structural and nonstructural controls as appropriate should be adequate for the daily cover phase of landfill construction and for soil stockpiles. Final cover should be managed as provided for in the closure and post closure care plan required by 30 TAC 330 Subchapter K, Closure and Post-Closure.

Erosion control for above grade top dome surfaces and external embankment side slopes that drain directly to the site perimeter stormwater management system, have received intermediate cover and either reached their permitted configuration or will remain inactive for longer than 180 days should be managed using a system of nonstructural and structural erosion and sediment controls to meet rule requirements for the intermediate cover phase of landfill construction. The purpose of this guidance document is to disc ss designs and calculations and to address specific controls before and after establishment of vegetation on intermediate cover top dome surfaces and external embankment s de slopes.

II. Designs and Typical Calculations for Top Dome Surf ces an External Embankment Side Slopes to Demonstrate the Adequacy of the Measures, Practices and/or Devices Proposed:

a. Sample calculations and designs for sizing the necessary drainage collection, conveyance, and/or detention structures in accordance with 0 TAC §330.63(c).

b. Describe soil stabilization practices, perimeter contr top and side slope runoff controls, collection, conveyance, and containment stru res at the areas where they will be installed at the site for the intermediate cover phase to dome surfaces and external embankment side slopes. Include a de ption of, and spe ifications for, temporary sediment retention structures for all phases velopment.

c. Provide a description of the hydrologic method and calculations used to estimate peak flow rates, peak velocities and run-off vo umes as required. Provide information to demonstrate that estima velocities are below permissible non-erodible velocities under similar conditions. *("simila conditions" i interpreted to mean similar soil, vegetation, other cover typ opography, slope, etc., as the subject surface).*

d. Soil erosion loss may calculated using the Soil Conservation Service of the United States D ent of Ag culture's Universal Soil Loss Equation or equivalent or better methods appro d by the cutive director. The applicant should provide information to demonstrate that e estima ed potential soil loss from the intermediate cover phase top me surfaces and xternal embankment slopes does not exceed the permissible soil loss fo omparable soil lope lengths and soil-cover conditions. *Calculated permissible soil loss m y not exceed 50 tons/acre/year depending on location/precipitation and slope length.*

   The applican shall demonstrate that the various proposed procedures and typical controls to be implemented on these slopes will ensure that soil loss does not exceed the maximum soil loss specified above. This demonstration should consist of descriptions of where structural controls should be installed (e.g. maximum slope steepness, slope lengths and berms spacing, maximum spacing of drop chutes, maximum spacing of silt fencing, etc.) and parameters for non-structural control (e.g. types of vegetation to be utilized for erosion control, planting schedules, vegetation maintenance, etc.). Specific configurations or development scenarios showing specific locations of structural controls are not required. The applicant should demonstrate that the controls proposed will achieve soil loss that does not exceed the maximum erosion soil loss specified above for the parameters proposed for installation. The controls proposed to keep soil loss below this maximum soil loss shall be proposed to be installed within 180 days from when the

intermediate cover is constructed. Applicants with sediment capture facilities may incorporate the use of sediment capture and intermediate cover replenishment procedures to demonstrate that the net annual soil loss for that facility is less than the above amount.

e. Provide sample hydraulic calculations and designs for sizing the necessary drainage collection, conveyance, and/or detention structures in accordance with 30 TAC §330.63(c).

III. Typical Erosion and Sediment Control Management Practices and Specifications:

a. **Side Slope Controls:** The use of benches, terraces, berms or swales is recommended to decrease down slope velocities of runoff that could cause erosio Benches, terraces and berms should direct the flow to a protected drainage system (dow hute) and outlet. The frequency of spacing should be based on a soil loss as described in th andfill final condition plan or to no more than 50 tons/acre/year. The estimated p k velocity should be less than the permissible non-erodible velocity under similar condition Rolled erosion control mats or blankets made from na ural or synthetic fiber, or compost/mulch/straw blankets, as example, m also be sed as cover on side slopes and on open earthen conveyance structures.

b. **Seeding and Sodding:** Establishment of vegetation the top dome surfaces and the external embankment side slopes r mains the preferred s face protection practice for control of erosion. Perennial vegeta i ver from seeding has been shown to remove between 50 and 100 percent of total suspend olids from stormwater runoff, with an average removal of 90 percent (USEPA, 1993). A g of at least 60% vegetative cover is recommended.

c. **Lining for Conveyanc Structures:** f runoff may cause erosion in a conveyance structure, the structure sho ld be lined us ng grass or sod, turf reinforcement mats, blankets, riprap, ncrete, gabions or other appropriate material. Details of temporary and permanent sur ce st i m asures for all conveyance structures within development areas a e site must be provided.

d. **Check Dams** heck dam are constructed using gravel, rock, gabions, compost socks, o sand bags to re ce flow elocity and therefore erosion in a swale or channel. Check m design criteria hould address, at a minimum, control of runoff velocity, hydraulic cap city to store an release runoff in a non-erodible manner, stability of dam cons ction mater als; check dam foundation preparation.

e. **Silt Fenc :** Silt fences or fabric filter fences may be used where there is sheet flow. The maximum d ainage area to the fence should not exceed the manufacturer's specification but in no case be greater than 0.5 acre per 100 feet of fence. To ensure sheet flow, a gravel collar or level spreader can be used upslope of the silt fence. The silt fence should be installed to reflect the interim erosion and sediment control needs rather than mirror the property lines or limits of disturbance.

f. **Compost Filter Berms:** Compost filter berms, or mesh socks filled with compost material, measuring at least 1 foot high x 2 feet wide, may be installed at the bottom of slopes. The design and placement of compost filter berms must address the prevention of pooled water over the cover system.

g. **Inlet Protection:** Inlet protection consisting of silt fence barriers, straw bale inlet barriers, block, and gravel drop inlet filters, etc., should be used where appropriate. Inlet protection is suited for small drainage areas (less than 1 acre).

h. **Stabilization Schedule:** Estimates regarding time to stabilize (treat, cover, or vegetate to reduce erosion potential) exposed clearings, stockpiles and fills, and time to establish vegetation should be described.

i. **Wind Erosion Control Measures:** Techniques to minimize wind erosion (blowing of dust or sediments) should be described if appropriate.

j. **Soil Types:** Descriptions of the soil types prevalent in the area (use the USDA/SCS County Soils Map), soil-types to be used for construction and the proposed erosion and sediment control techniques relating to the soil types should be scribed.

k. **Climate and Weather:** The climate and weather patterns prevale at the site should be considered in the scheduling of development to take advantage of th attern in reducing soil erosion and sedimentation.

l. **Water Bodies and Waterways:** Identificat of wate bodies and waterways on site and adjacent to the site, and a description of plan r their protection from sediment-laden runoff from the site should be described.

IV. Describe Inspection, Maintenanc and Recordkeepin Frequencies and Techniques:

a. Describe an inspection and recordkeeping schedu determine the overall effectiveness for temporary erosion control structures.

b. Installation, regular insp ion, and maintenance and record keeping of plan practices should be made art of the raining curricula for landfill personnel.

c. Discuss plans for rem l f the temporary erosion control devices as they are replaced with perma nt erosion and sediment control devices at the site.

V. Explanations of rms:

a. Permissible non-e dible" velocity as referenced in 30 TAC §330.305(d)(1).

i. ermissible v ocity for sheet flow, this should be related to the type of soil (erodible v non-erodible) and the type of vegetation or synthetic cover over which the flow occ The USDA has published data on permissible non-erodible velocities based on the il and vegetation cover-type. Manufacturers of synthetic erosion control covers usually include allowable non-erodible velocities over such surfaces.

b. Permissible soil loss for intermediate and final phases.

i. Permissible soil loss for interim conditions is greater than that considered acceptable for final cover. Although the interim condition can last for decades, unlike final cover conditions, the landfill is still operational. Thus during the operational phase of landfill construction, personnel and equipment are available to remediate erosion conditions and place additional soil. Basing permissible losses in part on the facility's ability to replenish what is lost is an acceptable practice. Additionally, for unavoidable soil loss during the intermediate phase, there should

be structures within the site that prevent the losses from leaving the site, e.g. silt screens installed on benches, channels, perimeter ditches, etc., to trap eroded materials prior to reaching the sedimentation basin, or a sedimentation basin (with analysis showing that the sediments will be recovered prior to the flow moving offsite).

ii. The recommended permissible soil loss for the final cover phase remains at 2 to 3 tons/acre/year.